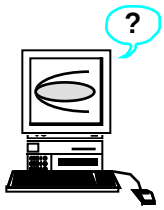


Ask Dr. ALOHA:

When Should I Use ALOHA?

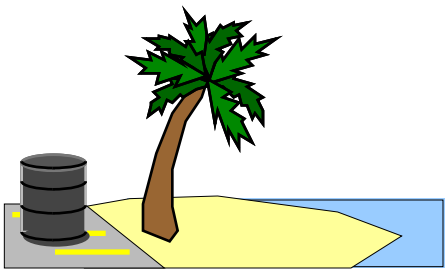
During a response to a hazardous chemical accident, it's natural to grab for any tool that looks as though it might help you to make critical decisions quickly. At first glance, ALOHA appears to be such a tool. But just as a hammer is useful for pounding nails but useless for cutting wood, ALOHA can model some accident scenarios but not others. *When ALOHA can't model a scenario, you'll lose valuable time if you try to use it.*

How good are you at recognizing situations when you can use ALOHA and situations when you can't? Here's a quiz to help you to test your knowledge and hone your skills. Once you think you've found the answers, or when you're ready to give up, turn to the end of this article to see the answers.

Tips: As you work on the questions below, take particular note of the list of limitations you see whenever you start up ALOHA; click Help or check your manual to learn more about each limitation. And if you have access to the World Wide Web, try out the **ALOHA Decision Keys**. You can use these keys to decide whether to use ALOHA for any of the scenarios below (or any real-world scenarios you might encounter). You'll find the keys on the NOAA HAZMAT web site at http://response.restoration.noaa.gov/cameo/decision/keyindex.html .

The Questions

1. Just outside a chemical manufacturing plant near Louisville, Kentucky, a train and a towing vehicle have collided. The towing vehicle is lying on its side and leaking fuel, which has begun to pool in the railbed. The plant manager tells the responding team of firefighters that the company uses gasoline in all of its towing vehicles. Can the firefighters use ALOHA to model this release?

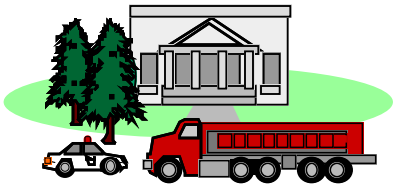


2. A drum full of liquid m-xylene is found abandoned in a parking lot near Fort Lauderdale, Florida. The drum appears to be in such poor condition that if it were moved, the product could spill through a portion of its base that is nearly rusted through. The drum is upright and about 3 feet in height. When a fire department hazmat team

arrives, they estimate that the drum contains about 55 gallons of product. A populated swimming beach is located about 200 yards downwind of the parking lot. Can the firefighters use ALOHA to model the hazard to the people at the swimming beach?

3. Just outside Albany, New York, a guard at a chemical manufacturing facility alerts the police when he discovers an unusual device attached to a storage tank containing methyl alcohol stored at ambient temperature. The responding police officers examine the device and quickly realize that it may be a bomb. There is a housing complex about 1 mile downwind of the facility. An explosion may be imminent. Can the officers use ALOHA to model this potential release?

4. In an industrial park outside of Baton Rouge, Louisiana, an outdoor tank contains liquid benzene stored at the ambient air temperature. The tank is located inside a concrete containment basin. One night, a security guard discovers that benzene has begun to leak out of the tank through a 2-inch hole, and that liquid benzene is pooling in the containment area. The guard calls the local fire department and the facility manager. A team of firefighters soon arrives and begins to assess the situation. Can they use ALOHA to model this release?



5. An alarm goes off at the Boise, Idaho, Natural History Museum. When police officers arrive and begin to inspect the scene, their eyes soon begin to water, and they begin to feel nauseated. The officers request fire department assistance. The Boise Fire Department hazmat team arrives, recons the area, and finds a storage room window broken, and four broken jars and a pool of liquid on the asphalt driveway below the window. The firefighters estimate that each of the jars contained about 1 gallon of product. Although the labels on the jars are torn and soaking wet, the entry team is able to read the word “formaldehyde.” Can the hazmat team use ALOHA to model this release?

6. Two staff members from the Coast Guard Marine Safety Office at the Port of Seattle have boarded a container ship at anchor in response to a report of possible pollution. A water-like liquid has leaked from a container damaged when the ship's cargo shifted during ocean transit. The liquid has formed a 5 foot-by-5 foot puddle on the deck floor. There are no identifying labels on the container, but the Dangerous Cargo Manifest lists the container's contents as drums containing toluene. The container is stored in a lower deck, but a deck hatch has been opened to improve the ventilation in the lower decks. The temperature outdoors and in the hold is about 65°F. Seattle's downtown business district lies about half a mile directly downwind from the vessel. The IDLH for toluene is 500 ppm; its lower explosive limit is 1.1% and its upper

explosive limit is 7.1%. Should the officers use ALOHA to predict the hazard to Seattle's business district?

The Answers

1. No, the firefighters can't use ALOHA to model this release. ALOHA is designed to model pure chemicals only, so it can't accurately model mixtures and solutions. Gasoline is a complex mixture of chemicals. (An earlier "Ask Dr. ALOHA" article explained how to tell whether a chemical is pure. You can find this article on the NOAA HAZMAT web site at http://response.restoration.noaa.gov/cameo/dr_aloha/purechem/pure.html .)

2. Yes, the firefighters can use ALOHA to model this release. This scenario involves a pure chemical that has been released outdoors, and there's no fire, explosion, or chemical reaction involved. This is just the kind of event ALOHA is designed to model.

3. No, the officers can't use ALOHA to model this release, for two reasons. First, ALOHA is designed to model scenarios in which a chemical gets into the atmosphere by evaporation from a puddle or by exiting through an opening in a tank or pipe. It can't model explosions. Second, to make its footprint predictions, it assumes that the chemical that escapes from a container is the same chemical that disperses downwind. That is, it assumes that this chemical won't react to form other chemicals. But that won't be the case in this release. If the bomb detonates, the methyl alcohol, which is flammable, will ignite. As it burns, it will break down into carbon dioxide and water vapor (and perhaps a little carbon monoxide). It is the carbon dioxide and water vapor, not the methyl alcohol, that would disperse downwind in this scenario. ALOHA will not be able to model either the explosion or the gas dispersion in this scenario.

4. Yes, the firefighters can use ALOHA to model this release. This scenario, like scenario 2, involves a pure chemical that has been released outdoors, and there's no fire, explosion, or chemical reaction involved.

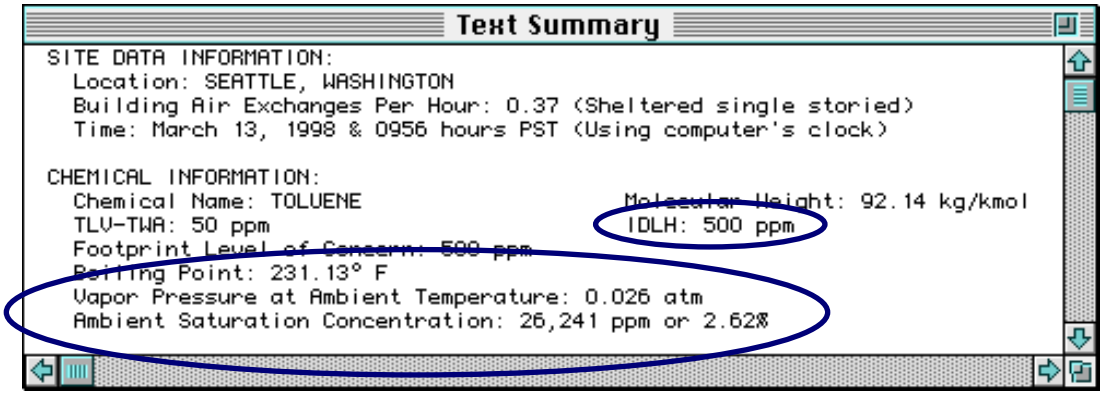
5. No, the firefighters can't use ALOHA to model this release. If they tried, they might be surprised to discover that formaldehyde is not in ALOHA's chemical library. That's because formaldehyde is usually found in solution in water. ALOHA can't predict source strength—the rate at which a chemical escapes into the atmosphere from a tank, pipe, or puddle—for a mixture or solution. However, if you have some other way to estimate this rate, you can use it in ALOHA as a direct source estimate. (An earlier "Ask Dr. ALOHA" article discussed chemicals like formaldehyde that are sometimes found in solution and sometimes in pure form. You can find this article on the NOAA

HAZMAT web site at http://response.restoration.noaa.gov/cameo/dr_aloha/solution/solution.html . You also can obtain a copy of a report explaining how to estimate the evaporation rate of a pool of hydrochloric acid (which is a solution of hydrogen chloride in water) and how to then use this rate estimate in ALOHA. You'll find this report at http://response.restoration.noaa.gov/cameo/toolkit.html .)

6. ALOHA can model only outdoor releases. Because the spill has occurred below deck—that is, indoors—you could run ALOHA to obtain a footprint for this scenario only if you had some other way to estimate the rate at which toluene vapor is passing through the hatch (ALOHA can't make this estimate for you). However, you could quickly guesstimate the approximate level of hazard, using the following pieces of information:

- ALOHA's Text Summary screen tells you that the IDLH for toluene, 500 ppm, is relatively high, compared with other toxic chemicals. This tells you that it would take a high concentration of toluene to pose a hazard to people. Its vapor pressure at 65 degrees F, also shown in the Text Summary window, is relatively low—just 0.047 atmospheres. The low vapor pressure tells you that the toluene can't evaporate very fast at the ambient temperature, so it would be hard for concentrations to build up high enough to threaten downtown Seattle.
- You know that the puddle is small and the toluene vapor can escape through just one hatchway. This adds to your knowledge that the source strength for this scenario would be low.

Using this information, you can judge that the toluene is very unlikely to evaporate fast enough to pose a threat to Seattle. But there's another potential hazard: Could the vapors collecting in the lower deck reach flammable levels? You can use ALOHA's estimate of **ambient saturation concentration** at 65 degrees F, which you also can find on the Text Summary window, to quickly predict the maximum concentration of toluene vapor in the hold; you then can compare this estimate to toluene's flammability limits.



(An earlier “Ask Dr. ALOHA” article explained how to do this. You can find this article on the NOAA HAZMAT web site at http://response.restoration.noaa.gov/cameo/dr_aloha/vessel/vessel.html .)

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